Trend Study 25C-17-03

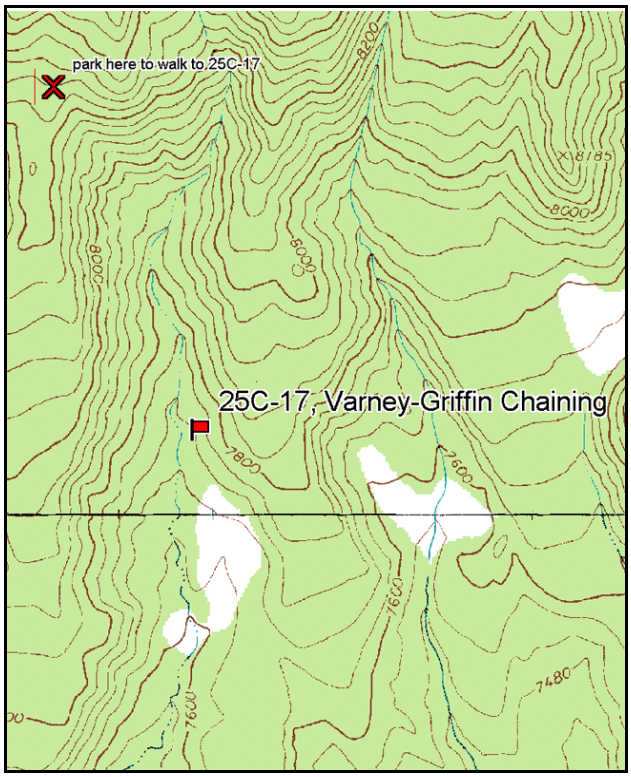
Study site name: Varney-Griffin Chaining . Vegetation type: Chained-Seeded P-J .

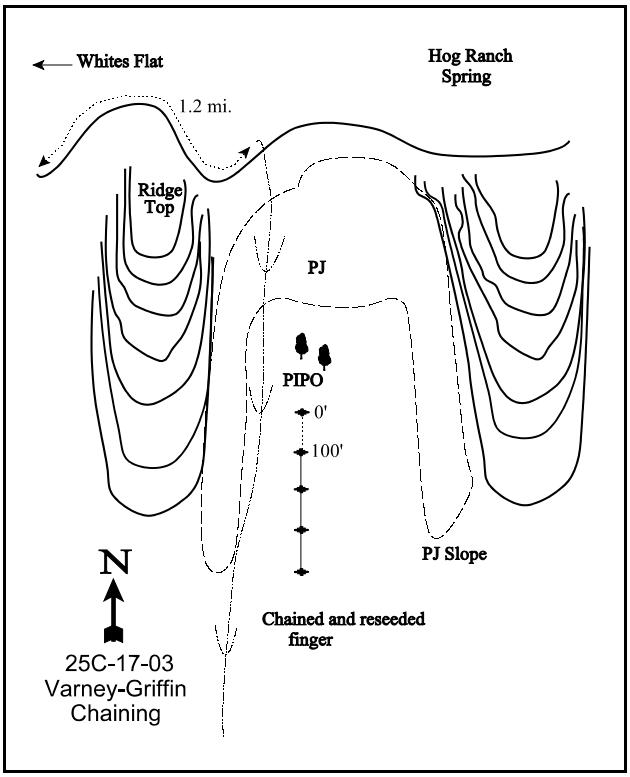
Compass bearing: frequency baseline 182 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft). No rebar.

LOCATION DESCRIPTION

North Creek Road begins at mile marker 55 off of SR12. From North Creek Reservoir, continue north on the main road for 2 miles to a fork. Turn right, go 2 miles to Whites Flat. Continue towards Hog Ranch Spring for 1.2 miles. Stop where the road curves across a large ridgetop. Walk along the east edge of this flat-topped ridge to where you can see the chaining in the drainage below. Hike down the side of the ridge toward the chaining. The study area is in the north end of this chained drainage. The study is marked by browse tag #7146.





Map Name: Wide Hollow

Diagrammatic Sketch

Township 34S , Range 1E , Section Unsurveyed

GPS: NAD 27, UTM 12S 4192232 N, 434932 E

DISCUSSION

Varney-Griffin Chaining - Trend Study No. 25C-17

The Varney-Griffin Chaining is a 1,100 acre chaining project completed in 1981. The chained foothills were seeded to grasses, bitterbrush, and fourwing saltbush. The transect is located in the upper end of the chaining in a narrow valley surrounded by mature pinyon-juniper and ponderosa pine. The side of the valley where the study site is located has a southwestern aspect, draining down to a small, intermittent wash which flows south. The slope is approximately 5% to 10% with an elevation of 7,720 feet. The area did not receive much deer use in past years, but it had the potential to be excellent winter and spring range for deer and elk. By 1998, wildlife use had increased on the site. Pellet group data from 1998 estimated 26 deer, 40 elk, and 23 cow days use/acre (64 ddu/ha, 99 edu ha, 57 cdu/ha). A few of the elk pellet groups were from summer use. Pellet group data from 2003 show increased elk use estimated at 71 days use/acre (175 edu/ha). Deer use was minimal at about 1 day use/acre while cattle use was estimated at only 2 days use/acre (5 cdu/ha).

The soil is a moderately deep sandy loam with little rock on the surface or within the profile. Effective rooting depth was estimated at barely 10 inches due to the compact nature of the soil which prohibited deeper soil penetrometer readings. There does not appear to be any rooting restrictions. Soil texture is a sandy loam which is slightly acidic in reaction (pH 6.1). Average soil temperature is high for this elevation averaging 62.7°F at a depth of 13.5 inches in 2003. The soil is loose and friable on the surface, permitting the establishment of a dense stand of perennial grass. There is some localized soil movement, but erosion is limited by the excellent herbaceous ground cover. More soil erosion was evident in 2003 due to a decline in herbaceous cover. There was considerable evidence of overland flow, rills, and gullies due primarily to runoff from nearby slopes. The soil condition class was determined to be slight in 2003.

Seeded grasses currently dominate the site but some browse plants are scattered throughout the chaining. Preferred species include mountain big sagebrush and bitterbrush. Density of bitterbrush is low, estimated at only 33 plants/acre in 1987 and 1991, and 80 in 2003. There were no seedling or young bitterbrush encountered during any reading. Bitterbrush displayed heavy use on all plants sampled in 1987 and 1991, but moderate to heavy use in 2003.

Only 66 plants/acre of sagebrush were estimated during the 1987 and 1991 readings, but the larger sample used in 1998 estimated a much higher density of 820 plants/acre. These plants are mostly lightly hedged, in good vigor and have low percent decadence. Seed production was good in 1998 and 2003 and annual leader growth averaged 2.3 inches in 2003. Average height of mature plants has slowly increased from 25 inches in 1987 to 31 inches in 2003.

The most numerous browse species is broom snakeweed which has invaded the site. Population estimates in 1987 numbered 2,999 plants/acre. That number decreased by 81% to only 566 plants/acre in 1991. However, the population rebounded to 1,400 in 1998 and 2,720 by 2003. Stickyleaf low rabbitbrush is also fairly abundant and has increased dramatically since 1998 from 180 plants/acre to 1,740 plants/acre. Surviving pinyon pine trees have also been released since the treatment. Four inch seedlings were quite common in 1987 at an estimated density of 233 plants/acre. There are also a few young junipers and ponderosa pines. Point-quarter data from 1998 estimated a density of 54 pinyon and 22 juniper trees/acre. Average diameter of pinyon was 2.9 inches while that of juniper was 4.9 inches. Most trees were in the 4 to 6 foot height class. Point-quarter data from 2003 show an increase in tree density. Pinyon density was estimated at 104 trees/acre with an average diameter of 2 inches. Fifty-five percent of the pinyon trees sampled were seedlings. Juniper density increased slightly to 30 trees/acre with an average diameter of 3.5 inches. Over half of the juniper trees sampled were in the 4 to 8 foot height class. Other browse occurring in the area include Gambel oak, rubber rabbitbrush, gray horsebrush, and serviceberry.

The herbaceous understory is abundant and dominated by seeded perennial grasses which provide 88% of the

grass cover in 1998. Crested wheatgrass is the most abundant, but the rhizomatous smooth brome and intermediate wheatgrass are also prominent. Blue grama, a warm season grass, is also common while other native grasses are scattered over the site. The grasses appear to be effectively competing with the browse seedlings. Seeded forbs, sweet clover and alfalfa, were observed on the site but not sampled. Eighteen forb species occurred in the frequency belts in 1987 and 1991. Twenty-six perennial and annual species were encountered in 1998. The most notable species are silvery lupine and bastard toadflax. Only light use is evident on the herbaceous plants.

1987 APPARENT TREND ASSESSMENT

Soil conditions have improved compared to the untreated pinyon-juniper woodland. Herbaceous cover is good and erosion is minimal in the chaining. The browse component is lacking but densities should increase in time. Mountain big sagebrush and bitterbrush are moderately to heavily browsed but have good vigor and low decadence. Seeded grasses dominate the herbaceous understory with crested and intermediate wheatgrass being the most abundant. Several native perennial grasses are also found on the site in good numbers. Forbs are diverse but only a few are common. Bastard toad flax and silvery lupine are the most abundant forbs.

1991 TREND ASSESSMENT

Basic cover characteristics for this site have not changed a great deal since 1987 with the exception of a 2 fold increase in vegetative basal cover and a decline in litter cover from 75% to 65%. Much of the loss in litter cover is probably due to the decomposition of chaining litter. Collectively, pavement and rock have gone from only 1% to 3%. Percent bare ground has increased only slightly from 17% to 20%. The site is still in excellent condition and trend for soils is considered stable. There has been no change in densities for two key species, mountain big sagebrush and antelope bitterbrush. One concern for the area was the possible increase in broom snakeweed, but it's population has actually gone down by 81%, from almost 3,000 to 566 plants/acre. Trend for browse on this site is stable, but poor at this time. This site would make a good spring or fall range with the high amounts of grasses and forbs. The herbaceous understory is still in excellent condition, but only 11 out of 33 species have shown any increases in nested frequency and many of these were not in very high frequencies to begin with. Therefore, the trend is slightly downward, but it is still in excellent condition.

TREND ASSESSMENT
soil - stable (3)
browse - stable, but low numbers (3)
herbaceous understory - slightly downward (2)

1998 TREND ASSESSMENT

Trend for soil is up with a decline in percent bare ground from 20% to 11% and a slight increase in litter cover. Trend for browse is also up with an increase in density of the two key species, bitterbrush and mountain big sagebrush. Both species show light use, good vigor and low decadence. Sagebrush also displays improved reproduction with good numbers of seedlings and young. Trend for the herbaceous understory is mixed. Sum of nested frequency of grasses is down slightly while frequency of forbs is up slightly. The decline in nested frequency of grasses is mainly due to a significant decline in the nested frequency of blue grama, a warm season increaser, and needle-and-thread grass. Frequency of intermediate wheatgrass also declined but not significantly. Nested frequency of crested wheatgrass and smooth brome increased slightly. Forbs provide only 18% of the herbaceous vegetation cover on the site. The only forb to increase significantly was silvery lupine which is the dominant forb. With this in mind, trend for the herbaceous understory is considered stable with a change in composition for grasses.

TREND ASSESSMENT

soil - up (5)
browse - up (5)
herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil down due to drought. Total herbaceous cover has declined 61%. Bare ground increased 3 fold, litter cover declined, and total vegetation cover declined. Erosion was evident, but most was due to runoff from nearby slopes. Trend for browse is stable but still limited in numbers. Mountain big sagebrush remained similar in density. Use was heavier but vigor remains good and decadence low. Bitterbrush is still limited in number. It is moderately to heavily browsed with some plants displaying poor vigor and 25% of the population is decadent. Density increased to 80 plants/acre, but some of the increase may be due to the difficulty identifying individual plants which have an average crown diameter of nearly 5 feet. Pinyon trees are increasing on the site. Point-quarter data estimated 104 trees/acre with 55% of those classified as seedlings. The herbaceous understory trend is down. Sum of nested frequency of perennial grasses declined 57% while nested frequency of perennial forbs increased slightly. All seeded grasses, crested wheatgrass, intermediate wheatgrass, and smooth brome, declined significantly in frequency. Perennial grass production declined 4 fold from 24% cover in 1998 to only 5.4% in 2003. Grass composition has remained similar with crested wheatgrass providing 57% of the grass cover.

TREND ASSESSMENT

soil - down (1)
browse - stable (3)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 25C, Study no: 17

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
G	Agropyron cristatum	$_{b}$219	$_{b}$214	$_{b}$228	$_{a}$128	13.38	3.07
G	Agropyron intermedium	$_{c}$145	$_{b}$103	$_{b}$69	$_{a}$14	1.14	.10
G	Bouteloua gracilis	$_{b}$144	$_{b}$128	$_{a}$39	$_{a}$49	.82	.97
G	Bromus inermis	$_{b}$122	$_{c}$174	$_{c}$188	$_{a}$30	6.52	.34
G	Carex spp.	$_{a}$-	$_{a}$5	$_{b}$29	$_{a}$3	.46	.03
G	Elymus salina	-	7	4	-	.15	-
G	Oryzopsis hymenoides	11	5	3	-	.00	-
G	Poa fendleriana	$_{ab}$10	$_{a}$4	$_{b}$23	$_{ab}$13	.78	.51
G	Sitanion hystrix	$_{b}$9	$_{ab}$2	$_{a}$3	$_{a}$-	.00	-
G	Sporobolus cryptandrus	$_{a}$-	$_{b}$12	$_{a}$2	$_{a}$-	.00	-
G	Stipa comata	$_{bc}$59	$_{c}$56	$_{ab}$28	$_{a}$25	.43	.36
Total for Annual Grasses		0	0	0	0	0	0
Total for Perennial Grasses		719	710	616	262	23.74	5.41
Total for Grasses		719	710	616	262	23.74	5.41
F	Alyssum alyssoides (a)	-	-	$_{b}$25	$_{a}$-	.06	-

Type	Species	Nested Frequency				Average Cover %	
		'87	'91	'98	'03	'98	'03
F	Androsace septentrionalis (a)	-	-	8	-	.04	-
F	Arabis spp.	-	1	-	-	-	-
F	Artemisia ludoviciana	4	3	2	-	.15	-
F	Astragalus spp.	2	2	6	2	.04	.00
F	Chaenactis douglasii	-	-	1	-	.00	-
F	Chenopodium fremontii (a)	-	-	-	2	-	.00
F	Chenopodium leptophyllum (a)	-	-	$_{a}$-	$_{b}$14	-	.53
F	Comandra pallida	29	22	39	29	1.08	.21
F	Cryptantha spp.	$_{b}$10	$_{ab}$6	$_{b}$7	$_{a}$-	.02	-
F	Dalea spp	-	-	-	1	-	.00
F	Descurainia pinnata (a)	6	-	1	-	.00	-
F	Erigeron spp.	-	6	8	-	.04	-
F	Eriogonum racemosum	4	4	10	12	.08	.05
F	Eriogonum umbellatum	6	5	5	2	.04	.03
F	Gilia spp. (a)	1	-	-	-	-	-
F	Ipomopsis aggregata	-	-	5	-	.16	-
F	Lappula occidentalis (a)	-	-	1	11	.00	.36
F	Lesquerella rectipes	$_{b}$18	$_{b}$12	$_{ab}$8	$_{a}$-	.04	-
F	Lotus utahensis	-	-	1	-	.15	-
F	Lupinus argenteus	$_{bc}$58	$_{a}$27	$_{c}$63	$_{ab}$33	2.91	1.07
F	Lychnis drummondii	-	-	2	-	.03	-
F	Machaeranthera canescens	$_{b}$11	$_{a}$-	$_{a}$4	$_{a}$-	.00	-
F	Medicago sativa	-	-	-	-	.00	-
F	Oenothera spp.	1	3	7	-	.01	-
F	Oenothera pallida	3	12	13	11	.05	.19
F	Penstemon comarrhenus	-	5	-	-	-	-
F	Penstemon spp.	$_{b}$23	$_{a}$5	$_{a}$7	$_{a}$1	.04	.03
F	Penstemon pachyphyllus	8	1	-	-	-	-
F	Phlox longifolia	2	8	6	1	.01	.00
F	Polygonum douglasii (a)	-	-	6	-	.01	-
F	Senecio multilobatus	$_{b}$49	$_{a}$3	$_{a}$12	$_{c}$129	.08	3.24
F	Sphaeralcea coccinea	$_{a}$8	$_{b}$22	$_{a}$3	$_{a}$6	.01	.03
Total for Annual Forbs		7	0	41	27	0.12	0.90
Total for Perennial Forbs		236	147	209	227	5.00	4.88
Total for Forbs		243	147	250	254	5.12	5.78

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 25C, Study no: 17

Type	Species	Strip Frequency '98	Strip Frequency '03	Average Cover % '98	Average Cover % '03
B	Artemisia frigida	0	5	-	.21
B	Artemisia tridentata vaseyana	31	34	5.81	8.66
B	Chrysothamnus nauseosus	0	0	-	-
B	Chrysothamnus viscidiflorus viscidiflorus	8	24	.38	.82
B	Gutierrezia sarothrae	30	37	1.21	1.22
B	Juniperus osteosperma	2	2	1.12	1.92
B	Pinus edulis	5	7	1.80	2.71
B	Purshia tridentata	2	4	.38	.68
B	Quercus gambelii	4	5	2.51	3.47
B	Symphoricarpos oreophilus	1	1	.85	.98
B	Tetradymia canescens	1	2	.00	.03
Total for Browse		84	121	14.09	20.70

CANOPY COVER, LINE INTERCEPT --
Management unit 25C, Study no: 17

Species	Percent Cover '98	Percent Cover '03
Artemisia frigida	-	.23
Artemisia tridentata vaseyana	-	9.56
Chrysothamnus viscidiflorus viscidiflorus	-	.41
Gutierrezia sarothrae	-	1.38
Juniperus osteosperma	.80	1.43
Pinus edulis	-	4.33
Purshia tridentata	-	1.21
Quercus gambelii	1.20	2.90
Symphoricarpos oreophilus	-	.25
Tetradymia canescens	-	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 25C, Study no: 17

Species	Average leader growth (in) '03
Artemisia tridentata vaseyana	2.3
Purshia tridentata	2.5

POINT-QUARTER TREE DATA --
Management unit 25C, Study no: 17

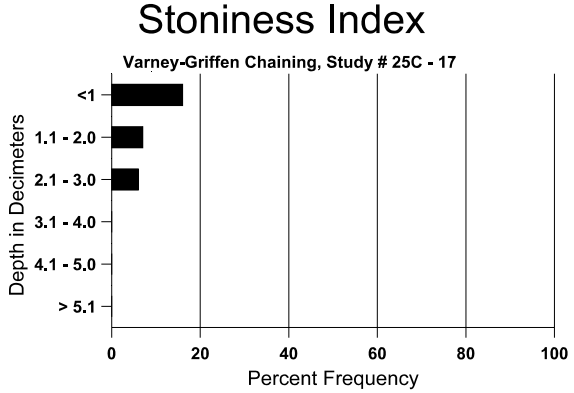
Species	Trees per Acre		Average diameter (in)	
	'98	'03	'98	'03
Juniperus osteosperma	22	30	4.9	3.5
Pinus edulis	54	104	2.9	2.0

BASIC COVER --
Management unit 25C, Study no: 17

Cover Type	Average Cover %			
	'87	'91	'98	'03
Vegetation	6.25	10.75	48.51	29.84
Rock	0	.50	.16	.23
Pavement	1.25	2.25	1.11	2.62
Litter	74.75	65.00	68.40	55.40
Cryptogams	.50	1.75	.92	0
Bare Ground	17.25	19.75	10.81	30.42

SOIL ANALYSIS DATA --
Management unit 25C, Study no: 17, Study Name: Varney-Griffin Chaining

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
9.8	62.7 (13.5)	6.1	73.1	12.4	14.6	1.4	12.7	134.4	.3



PELLET GROUP DATA --
Management unit 25C, Study no: 17

Type	Quadrat Frequency	
	'98	'03
Rabbit	52	20
Elk	13	41
Deer	9	9
Cattle	6	3

Days use per acre (ha)	
'98	'03
-	-
41 (101)	71 (175)
26 (64)	1 (2)
23 (57)	2 (5)

BROWSE CHARACTERISTICS --
Management unit 25C, Study no: 17

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Amelanchier utahensis											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	52/54
Artemisia frigida											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**140**	-	-	140	-	-	0	0	-	0	14/13
Artemisia tridentata vaseyana											
87	**66**	-	-	66	-	-	50	0	0	0	25/21
91	**66**	-	-	66	-	-	0	0	0	0	29/31
98	**820**	80	220	580	20	20	5	0	2	0	29/40
03	**780**	-	60	600	120	20	28	5	15	0	31/44
Chrysothamnus nauseosus											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	46/57
Chrysothamnus viscidiflorus viscidiflorus											
87	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**33**	-	-	33	-	-	0	0	0	0	14/9
98	**180**	40	20	160	-	-	0	0	0	0	21/21
03	**1740**	-	180	1500	60	140	2	0	3	1	17/19

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Gutierrezia sarothrae											
87	**2999**	133	633	2333	33	-	0	0	1	0	9/8
91	**566**	333	233	300	33	-	6	0	6	18	7/8
98	**1400**	520	660	740	-	-	0	0	0	0	12/13
03	**2720**	-	280	2380	60	100	0	0	2	.73	9/8
Juniperus osteosperma											
87	**33**	-	33	-	-	-	0	0	-	0	-/-
91	**33**	-	33	-	-	-	0	0	-	0	-/-
98	**40**	-	40	-	-	-	0	0	-	0	-/-
03	**60**	-	-	60	-	-	0	0	-	0	-/-
Pinus edulis											
87	**0**	266	-	-	-	-	0	0	-	0	-/-
91	**233**	100	233	-	-	-	0	0	-	43	-/-
98	**120**	20	100	20	-	-	0	0	-	0	-/-
03	**180**	-	100	80	-	-	0	0	-	0	-/-
Pinus ponderosa											
87	**0**	33	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	-/-
Purshia tridentata											
87	**33**	-	-	33	-	-	0	100	0	0	12/33
91	**33**	-	-	-	33	-	0	100	100	0	-/-
98	**40**	-	-	40	-	-	0	0	0	0	33/51
03	**80**	-	-	60	20	-	25	25	25	25	36/57
Quercus gambelii											
87	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**320**	-	40	220	60	20	0	0	19	6	62/38
03	**480**	-	-	480	-	40	0	0	0	0	43/32
Symphoricarpos oreophilus											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	26/109
03	**20**	-	-	20	-	-	0	0	-	0	35/58

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Tetradymia canescens											
87	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	20/28
03	**40**	-	-	40	-	-	0	0	-	0	18/29